

## Performance Of Financial Derivatives Trading On Indian Stock Exchanges

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### Abstract

The performance of financial derivative trading on the Indian stock exchanges has been assessed based on secondary data from SEBI annual reports for the last ten years (2010-2011 to 2019-2020). The prospects of four derivative segments, i.e., "index futures, stock futures, index options, and stock options", have been forecasted using a trend least-square regression model specifically for predicting the contract volume and turnover. It also uses statistical tools, including paired-sample statistics, correlations, and paired-sample tests in SPSS 16.0 to test the hypotheses. It highlighted that derivatives trading on Indian stock exchanges shows a positive trend in contract volumes and turnover. However, some of the hindrances to the progress of derivative trading in the capital market are the lack of adequate professional knowledge, loopholes in the regulatory framework of SEBI and insufficient automated facilities at stock exchanges and clearinghouses. In this study, an attempt has been made to suggest and recommend some views for further growth of derivative trading on Indian stock exchanges.

Keywords: FinancialDerivative, SEBI, Financial instrument, NSE, BSE and Performance.

### Introduction

The growth of derivative segments in the financial market has undergone a sea change due to the active participation of corporate bodies such as financial institutions, favourable economic policies, and positive global impact. Derivatives are now the most commonly used financial instrument in almost all organizations. In this globalized business era, business owners face price changes, exchange rate changes, economic policy changes, interest rate changes, and global trade policy changes. Due to adverse external environmental forces, business owners must use derivatives to improve their performance and growth. A derivative transaction helps a company reduce its market risk profile by passing it on to counterparties. In India, four main derivative instruments, including "index-futures", "equity-futures", "index-options", and "stock-options", are used in the trading plans of the NSE and BSE. The performance of the derivative segments has been directly affected by the benefit of reducing risk and increasing returns. The futures and options derivatives offer investors a way to protect themselves from the vagaries of the Indian financial market. Financial derivatives in futures and options trading in the styles of hedging, speculating, and arbitraging can have the benefits of "price discovery and risk management." This study of the performance of futures and options derivatives on the NSE and BSE, the various issues and prospects of derivative trading, brings new light on the financial derivative segments. For the future, it is necessary to comprehend the current level of growth and performance of India's financial derivatives markets.

## Review Of Literature

India has a sizable derivatives market that is backed by sophisticated risk management systems and rapidly expanding economic growth. Long-term memory strategies, including futures and options derivatives segments, are being used by Indian stock exchanges to increase asset value and hedge against potential losses. Futures and options trading is one of India's most tradable financial derivative markets, but it is still underdeveloped. The optimal hedge ratio outperforms benchmark models based on competing models, for instance, there is no difference between optimal returns hedge ratio and superior optimal hedge ratio. (1). India's exchange-trading and commodity derivative markets spanned the 1990s and 2001 when it expanded its portfolio to include foreign exchange derivatives and exchange-trading in financial instruments. In India's commodity, currency, and financial derivatives markets, there is a lack of scope and depth in each segment. Therefore, the Indian derivatives market should be in charge of determining the underlying price, as an underlying price in derivative markets must well function as a spread to the spot market. (2).

Since the inception of the different stock markets for derivative trading, and conditional structure of stock return on volatility has changed. It investigates the magnitude of organisational changes on "pre" & "post" derivatives managements subsequently accounting with irregular responses to "good" or "bad" information. Although derivatives appear to increase the volume of sent to the market spot, the value of that data are debatable. The author discussed the switching asymmetric GARCH (EGARCH) and PGARCH (PGARCH) models and the news impact curve's final basis. While derivatives appear to increase the volume of data sent to the market spot, the value of that data retrench poorly because they lack access to short-term trading information. The author concludes that retail investors dominate trading volumes in the Indian derivatives market (3). The Indian derivative segment, such as future and option derivative instruments, is weighed up to the international market and prospects in the worldwide derivatives market. The financial derivatives created are based on IFRS, US GAAP, and Indian GAAP. As shown in the study, factors influencing the growth of the Indian derivatives market involve increased asset price volatility, the evolution of the derivatives market, and derivative products traded frequently on BSE and NSE stock exchanges. Hence, the global derivatives market, its unresolved issues, and its prospects for the future. However, the Indian government should take a keen interest in the issue and form committees to investigate its limitations, drawbacks, and problems, among other things as well as SEBI -must take critical steps towards the growth of India's derivatives market. Therefore, many problems related to the "economies of scale", "tax", "legal bottlenecks", and "augmented off-balance-sheet revelation of banks" (4).

High-frequency trading (HFT) has become a common phenomenon in today's modern trading ecosystem, and trading transactions have increased with new technology. According to the study, the Indian market has gradually embraced high-frequency trading since 2009. The method used in this paper applies daily intraday values of securities of NSE from 2017. Moreover, the study highlights the impact of "HFT" on market quality as measured by market dynamics such as market liquidity, volatility, and hedging efficiency. In India, high-frequency trading (AT) cash and derivatives market share as a percentage of total turnover increased from 9.26% (on average) in 2010 to 49.8% in eight years. The Indian cash and derivative market volume surpassed 7.9 lakh crore in March 2018, with AT accounting for nearly 46.5 percent of traded volume, which increased by approximately 3.67 lakh crore.

The authors discovered that high-speed trading (HFT) had little impact on the financial derivative markets to improve liquidity and increase trade volume. However, it observed that there is no solid evidence that it affects volatility (5). The study highlighted five sections, each of which provided an overview of the summary about the topic and introduction about types of financial derivatives. Hence, the derivatives market's growth as well as regulation and policy

development, and the paper has compared the global derivatives market to the Indian derivatives market before providing a summary and remarks (6). From 2000 to 2015, the study examines the NSE's rise in the Indian stock derivatives market and the current state of the Indian equity derivatives industry. The volume of derivative products traded in India's derivatives market has increased dramatically. The study used secondary data sources from the existing literature. Hence, index options accounted for the majority of total derivatives turnover in 2014–15, while index futures' market share fell from 32.42 percent in 2008–09 to 7.4 percent that year, and single stock futures, India's most traded product until 2007–08, fell 14.9 percent. In 2015, the NSE ranked second in single stock futures, second in single stock index options and sixth in index futures and stock option contracts traded. Besides that, the demise of MINI-NIFTY contracts is also due to SEBI's strategy of discouraging individual investors from participating in the F & O segment (7).

In addition to "Index-futures", "index-options", "stock-futures", & "stock-options" were among the equity derivative segments studied on the NSE over the last ten years, from their inception in 2000-2001 to 2009-10. The study has implied different variables for instance "turnover", "number of contracts traded", "average daily trading volumes", & "compound-annual-growth-rate" in terms of various derivative products. Hence, the index futures and stock futures have the lowest turnover of the "four" categories of available products for trading on NSE's "futures", & "options" parts. Stock futures, which account for roughly half of all financial derivatives turnover, have seen the most significant drop. The Indian stock market is maturing and adjusting options in emerging markets(8).

### Objectives

1. To conduct an empirical study on the performance of financial derivatives trading on Indian stock exchanges from 2010-2011 to 2019-2020.
2. To forecast the growth trend and prospects of financial derivatives on the Indian stock exchange
3. To differentiate the "F & O" segments of the turnover value between BSE and the NSE.

### Hypothesis formation

1. **H<sub>1</sub>:** No statistical difference between the turnover values of the 'BSE' index future, and the turnover value of 'NSE' index futures.
2. **H<sub>2</sub>:** No statistical difference between the turnover values of 'BSE' stock futures and the turnover value of 'NSE' stock futures.
3. **H<sub>3</sub>:** No statistical difference between the turnover values 'BSE' index options and the turnover value of 'NSE' index options.
4. **H<sub>4</sub>:** No statistical difference between the turnover values of 'BSE' of stock options and the turnover value of 'NSE' stock options.

### Data Sources And Methodology Of The Study

The India financial derivatives segment showed performance based on annual data from the major stock exchanges of the BSE and the NSE. The study is analytical and exploratory, with data collected from secondary sources such as research papers, websites, other online resources, and the SEBI Bulletin Handbook-Statistics (2021) of annual data with a study period from 2010–20211 to 2019–2020. For data analysis, excel techniques calculate the percentage performance of the financial derivative, and trend least-square regression forecasts the volume and value of the derivative segments over the study period. Statistical tools imply testing hypotheses, including paired sample statistics and paired sample correlations, to support the study's objectives using the data analysis software SPSS 16.0.

### **Analysis, Discussion, And Findings**

The tables and figures in this report show the total number of contracts traded (also known as "volume traded") and the notional turnover value over the study period. In contrast, volume refers to the number of shares traded in a stock or contracts traded in futures or options, whereas turnover refers to how easy it is for investors to buy and sell their stock. Futures are a type of contract in which two parties agree to buy or sell an item at a fixed price, whereas options contracts are more flexible and allow for enhanced profit while reducing risk. Market participants also contribute to risk mitigation by increasing the certainty of futures and options contracts, which helps to keep the market price secure. The Indian stock exchanges' futures and options segments, on the other hand, are rapidly growing.

#### **1. Performance of financial derivative segments**

The following tables and graphs depict the business growth of financial derivatives traded on the NSE and BSE and their predicted values using trend growth analysis using least square regression.

**TABLE 1.** Business growth in financial derivative segments at NSE.

Year	Futures segments				Options segments			
	Index		Stock		Index		Stock	
	"No.of" contract	"Turnover "(Rs.in crores)	"No. of" contract	"Turnov er "(Rs.in crores)	"No. of" contract	"Turnove r" (Rs.in crores)	"No.of" contract	Turnove r (Rs.in crores)
2010 - 2011	16,50,2 3,653	43,56,754. 57	18,60,4 1,459	54,95,75 6.67	65,06,38 ,557	1,83,65,3 65.72	3,25,08 ,393	10,30,34 4.11
2011 - 2012	14,61,8 8,740	35,77,998. 37	15,83,4 4,617	40,74,67 0.72	86,40,17 ,736	2,27,20,0 31.62	3,64,94 ,371	9,77,031 .13
2012 - 2013	9,61,00 ,385	25,27,130. 67	14,77,1 1,691	42,23,87 1.93	82,08,77 ,149	2,27,81,5 74.19	6,67,78 ,193	20,00,42 7.25
2013 - 2014	10,52,7 0,529	30,85,296. 50	17,04,1 4,186	49,49,28 1.75	92,85,65 ,175	2,77,67,3 41.32	8,01,74 ,431	24,09,48 8.56
2014 - 2015	12,93,1 4,318	41,09,471. 65	23,76,0 4,741	82,91,76 6.25	1,37,86, 42,863	3,99,22,6 63.47	9,14,79 ,209	32,82,55 2.09
2015 - 2016	14,05,3 8,768	45,57,123. 86	23,42,4 3,967	78,28,60 6.00	1,62,35, 28,486	4,89,51,9 30.58	10,02,9 9,174	34,88,17 3.84
2016 - 2017	6,65,35 ,071	43,35,940. 87	17,38,6 0,130	1,11,29, 587.19	1,06,72, 44,916	7,27,97,2 87.70	9,21,06 ,012	61,07,48 5.86
2017 - 2018	5,76,74 ,584	48,10,454. 39	21,47,5 8,366	1,55,97, 519.72	1,51,50, 34,222	13,49,21, 876.29	12,64,1 1,376	96,55,00 8.54
2018	6,98,24 ,522	55,68,914. 42	25,55,3 3,869	1,61,47, 010.83	2,65,24, 57,487	20,33,02, 404.89	18,69,8 6,542	1,25,82, 374.84

2019								
2019 - 2020	9,44,72 ,538	66,77,312. 05	25,66,4 3,910	1,48,74, 729.23	4,57,63, 70,297	31,06,91, 969.32	19,78,3 5,132	1,22,88, 881.21
Average	<b>10,70,9 4,311</b>	<b>43,60,640</b>	<b>20,35,1 5,694</b>	<b>92,61,28 0</b>	<b>1,60,77, 37,689</b>	<b>9,02,22,2 45</b>	<b>10,11,0 7,283</b>	<b>53,82,17 7</b>

Source: SEBI: Hand Book Statistics -2021

Table 1 highlight the performance between the future segment, and the options segment. It's indicate that index option data between (2019-2020) of contracts and the turnover value shown 2,65,24,57,487, and 20,33,02,404.89 respectively. The number of contracts traded in stock futures and options increased slightly from 2018 to 2020, while the turnover value decreased. However, index options have shown the highest performance in the NSE business growth financial derivatives trading over the study period. As a result, the NSE has taken a step in the right direction toward increasing investor and trader participation in financial derivatives markets.

**TABLE 2.** The percentage per share of financial derivative segments(F&O) at NSE.

Year	Percentage per share of(F&O) in terms of Total							
	“Index futures”		“Stock futures”		“Index options”		“Stock Options”	
	“No. of contra ct	“Turno ver”	“No. of contra ct “	“Turnover”	“No. of contra ct	“Turnover”	“No. of contra ct	“Turn over”
2010-2011	15.96	14.9	17.99	18.79	62.92	62.81	3.16	3.53
2011-2012	12.13	11.41	13.14	13	71.7	72.48	3.03	3.11
2012-2013	8.49	8.01	13.05	13.4	72.55	72.232	5.91	6.34
2013-2014	8.21	8.07	13.268	12.95	72.29	72.67	6.25	6.31
2014-2015	7.04	7.39	12.93	14.91	75.05	71.79	4.98	5.9
2015-2016	6.7	7.03	11.161	12.08	77.36	75.52	4.78	5.37
2016-2017	4.75	4.59	12.42	11.79	76.24	77.14	6.59	6.48
2017-2018	3.01	2.92	11.22	9.45	79.16	81.78	6.62	5.85
2018-2029	2.21	2.34	8.07	6.8	83.81	85.57	5.91	5.29
2019-2020	1.84	1.94	5.01	4.32	89.29	90.17	3.86	3.56
<b>Average</b>	<b>7.03</b>	<b>6.86</b>	<b>11.83</b>	<b>11.75</b>	<b>76.04</b>	<b>76.22</b>	<b>5.11</b>	<b>5.17</b>

Source: Table 1

Table 2 above, highlights a share of the futures segment of turnover value, initially from 2010-2011 shows a positive trend of 15.96%, & 17.99%. And marginally decline in the subsequent year with 12.13%, & 13.14% respectively. While the constant declined till reached the bottom in 2019-2020 with a portion of 1.84%, & 5.01% due to the external factor. On the

other hand, the options segment highlights a share of turnover value and the index option initially, show a positive trend of 62.92% in 2010-2011, & continuously rise year after year. While the stock option initially show positive trends with 3.16% but declined the subsequent year 2011-2012 with a share of 3.03%. The contracts continuously rose until 2017-2018 with a share of 6.62% and fall due to the tension between India and China in 2018-2019 with a share of 5.91%.

**TABLE 3.** Business growth in financial derivative segments at BSE.

Year	Futures segments				Options segments			
	Index		Stock		Index		Stock	
	"No.of contract	"Turnover (Rs.in crores)	"No. of" contrac t	"Turnov er" (Rs.in crores)	"No. of "contract	"Turnover "(Rs.in crores)	"No. of" contrac t	"Turnov er (Rs.in crores)
2010-2011	5,613	154.08	0	0	10	0.25	0	0
2011-2012	70,73,3 34	1,78,448 .82	3,26,34 2	10,215.7 0	24775644	6,18,342.3 9	47505	1,469.10
2012-2013	47,04,6 02	1,22,373 .70	1,16,93 3	3,418.27	25723396 1	70,27,481. 09	387870	10,245.6 3
2013-2014	21,36,2 69	63,493.8 1	19,01,8 77	54,609.2 1	29635957 5	90,55,200. 65	154472 0	46,130.7 1
2014-2015	12,27,9 26	48,632.2 8	3,05,71 4	9,794.23	49823468 7	2,01,29,22 6.44	571054 2	1,75,088 .31
2015-2016	3,06,71 2	13,097.1 4	51,815	1,349.66	10342797 6	43,86,248. 80	242289 1	74,312.6 6
2016-2017	32,288	2,266.96	2,901	203.07	88349	4,469.34	0	0
2017-2018	44,117	3,217.54	467	36.73	114	8.2	3	0.18
2018-2029	438	39.16	271	17.78	30456	2,193.13	2	0.08
2019-2020	1,50,21 2	14,933.6 4	2,983	162.96	2512339	2,45,962.5 8	16349	1,209.35
<b>Average</b>	<b>15,68,1 51</b>	<b>44,666</b>	<b>2,70,93 0</b>	<b>7,981</b>	<b>11,82,66, 311</b>	<b>41,46,913</b>	<b>10,12,9 88</b>	<b>30,846</b>

Source: SEBI: Hand Book Statistics 2021

Table 3 above, show the BSE "business growth" of four major derivatives segments in terms of "contract number" and "turnover value" during the study period 2010-2020.

**TABLE 4.** The percentage share of financial derivative segments(F&O) at BSE

Year	Percentage share of(F&O) in terms of Total							
	Index futures		Stock futures		Index options		Stock Options	
	No. of contrac t)	Turnove r	No. of contract	Turnover	No. of contra ct	Turnove r	No. of contract	Turno ver
2010-2011	99.82	99.84	0	0	0	0.16	0	0
2011-2012	21.95	22.07	1.01	1.26	77	76.48	0.14	0.18

2012-2013	1.79	1.71	0.04	0.05	98	98.1	0.15	0.14
2013-2014	0.71	0.69	0.63	0.59	99	98.22	0.51	0.5
2014-2015	0.24	0.24	0.06	0.05	98	98.85	1.14	0.87
2015-2016	0.29	0.29	0.05	0.03	97	98.02	2.28	1.66
2016-2017	26.14	32.67	2.35	2.93	72	64.4	0	0
2017-2018	98.69	98.62	1.04	1.13	0	0.25	0	0
2018-2029	1.44	1.74	0.87	0.79	97	97.46	0	0
2019-2020	5.6	5.69	0.11	0.06	94	93.79	0.63	0.46
<b>Average</b>	<b>26</b>	<b>26</b>	<b>1</b>	<b>1</b>	<b>73</b>	<b>73</b>	<b>0.49</b>	<b>0.38</b>

Source: Table 3

In table 4 above, we examined the percentage per share of the futures and options segment in terms of the total “number of contracts and turnover value”. It observed index-futures initially from 2010-2011 showed a positive trend of 99.82%, then from 2011-12 marginally declined in the subsequent years, with 21.95% and 22.07%, respectively. Although for five consecutive years (2012 to 2017) it was in constant decline, from 2017 through 2018 the index's future once gained momentum with a share of 98.69% and 98.62%, whereas in the two recent years from 2018-19 to 2019-20 index futures performed very poorly with a share of 1.44%, 1.74, 5.6%, and 5.7%. Consequently, the stock future shows a poor performance throughout the study period, which means that BSE has some sort of internal and external environment factor over the performance of the financial derivatives segment. In contrast, the options segment highlights a share of the total “No. of contracts & turnover value”. Initially, the index option showed a zero trend of 0%, 0.16% in 2010-2011 and the next 5 years from 2011-12 to 2016-17, which showed a remarkable rise year after year until reaching a decline in 2017-18 with a share of 0%, 0.25%. From 2018-19 to 2019-20, the index option showed a positive performance with a share of 97%, 97.46% and 94%, 93.8% respectively.

**TABLE 5.** Predicted of financial derivative segments in BSE&NSE

Year/ observ ation	Actual(F&O) Total in BSE		Predicted BSE		Actual(F&O) Total in NSE		Predicted NSE	
	No. of contrac t (y)	Turnover( Rs.in crore) (y)	No. of contrac t (y1)	Turnover( Rs.in crore) (y1)	No. of contrac t (y)	Turnove r(Rs.in crore) (y)	No. of contrac t (y1)	Turnover( Rs. in crore) (y1)
2010- 11(1)	5,623	₹ 154.33	197972 238	₹ 64,83,434 .05	103,42, 12,062	₹ 2,92,48, 221.07	517876 503	₹ - 3,05,81,13 6.74
2011- 12(2)	3,22,22 ,825	₹ 8,08,476. 00	180893 603	₹ 59,82,761 .01	120,50, 45,464	₹ 3,13,49, 731.83	851560 608	₹ 4,87,191.6 5
2012- 13(3)	26,24,4 3,366	₹ 71,63,518 .70	163814 968	₹ 54,82,087 .97	113,14, 67,418	₹ 3,15,33, 004.04	118524 4713	₹ 3,15,55,52 0.04
2013- 14(4)	30,19,4 2,441	₹ 92,19,434 .44	146736 333	₹ 49,81,414 .93	128,44, 24,321	₹ 3,82,11, 408.14	151892 8819	₹ 6,26,23,84 8.43
2014-	50,54,7	₹	129657	₹	183,70,	₹	185261	₹

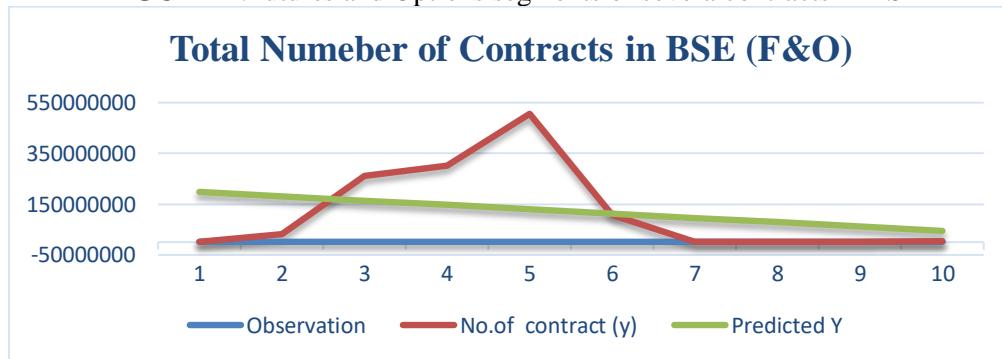
15(5)	8,869	2,03,62,7 41.27	698	44,80,741 .89	41,131	5,56,06, 453.47	2924	9,36,92,17 6.82
2015- 16(6)	10,62,0 9,394	₹ 44,75,008 .26	112579 063	₹ 39,80,068 .85	209,86, 10,395	₹ 6,48,25, 834.28	218629 7029	₹ 12,47,60,5 05.22
2016- 17(7)	1,23,53 8	₹ 6,939.37	955004 28.2	₹ 34,79,395 .81	139,97, 46,129	₹ 9,43,70, 301.62	251998 1134	₹ 15,58,28,8 33.61
2017- 18(8)	44,701	₹ 3,262.65	784217 93.2	₹ 29,78,722 .77	191,38, 78,548	₹ 16,49,84 .858.95	285366 5240	₹ 18,68,97,1 62.00
2018- 19(9)	31,167	₹ 2,250.14	613431 58.2	₹ 24,78,049 .73	316,48, 02,420	₹ 23,76,00 .704.98	318734 9345	₹ 21,79,65,4 90.39
2019- 20(10)	26,81,8 83	₹ 2,62,268. 53	442645 23.2	₹ 19,77,376 .69	512,53, 21,877	₹ 34,45,32 .891.82	352103 3450	₹ 24,90,33,8 18.78

Source: SEBI: Hand Book Statistics -2021 and Author compilation

Table 5 shows the actual and predicted total values of the F & O segments on the BSE and NSE based on the total number of contracts traded and total turnover value. As a result, both the BSE and NSE predicted tables showed significant changes. However, BSE indicates that the predictive value shown was slightly higher than the actual value of the total “No.of” contracts and “turnover”. On the other hand, the NSE has shown the predicted value moderately lower than the actual values of the total “No.of” contracts and turnover.

The following figures show how the BSE and NSE performed in the actual and predicted futures and options values of the total number of contracts and turnover.

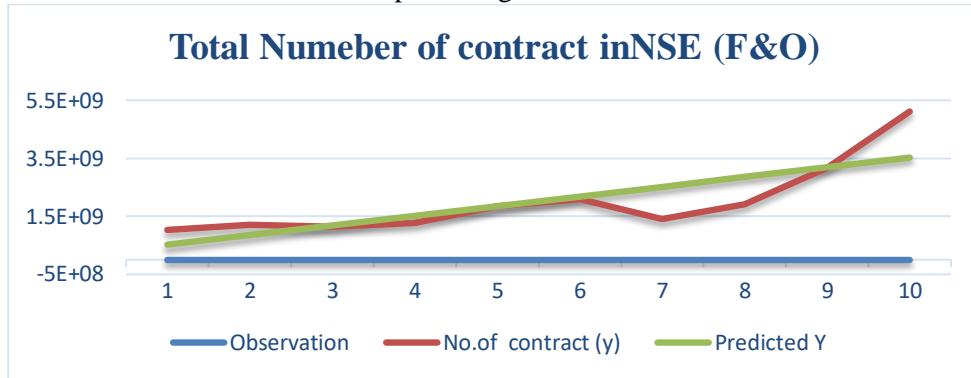
**FIGURE 1.**Futures and Options segments of several contracts in BSE



Source: Table-5

The above figure 1 shows the actual and predicted lines of the total number of contracts traded in the F & O segment on the BSE from 2010-2011 to 2019-2020. In the last 10 years of the observation period, BSE has seen an upward and downward trend in the actual number of traded contracts. There was a low point trend in fiscal years between 2010 and 2012. The upward trend began in 2012, and the number of contracts steadily increased between 2012 and 2015, especially between 2015-2016 the contracts reached a peak up point, but the trend line did not last long, and from 2017 to 2020, the trend line began sharply falling. However, the predicted line for the total number of contracts shows a linear trend line throughout the study period.

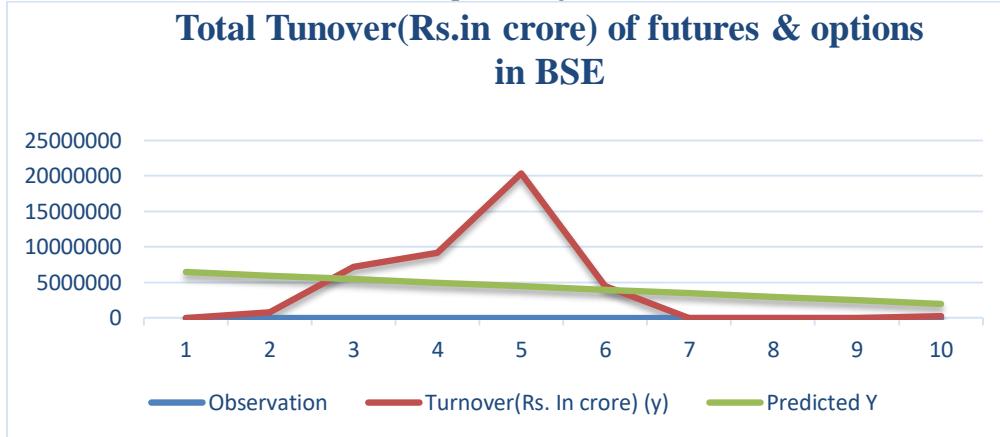
**FIGURE 2.**Futures and Options segments of several contracts in NSE



Source: Table-5

The above figure 2 shows the total number of contracts in the financial derivatives futures and options segments, both actual and predicted, on the NSE Indian stock exchange over the past ten years of the study period. It observed that in both cases, the actual traded contract and the predicted traded contract are moving relatively intersect in the observation period of 2010–2011 to 2019–2020, whereas the figure shows that the optimal level of both the actual and predicted is the same in the observation years of 2015–2016. On the other hand, from 2017–2018, the figure shows that the predicted contract is greater than the actual contract, and again, both reached the interception point and moved continuously from 2019– to 2020, which shows that the NSE has performed well in terms of contract numbers during the study period.

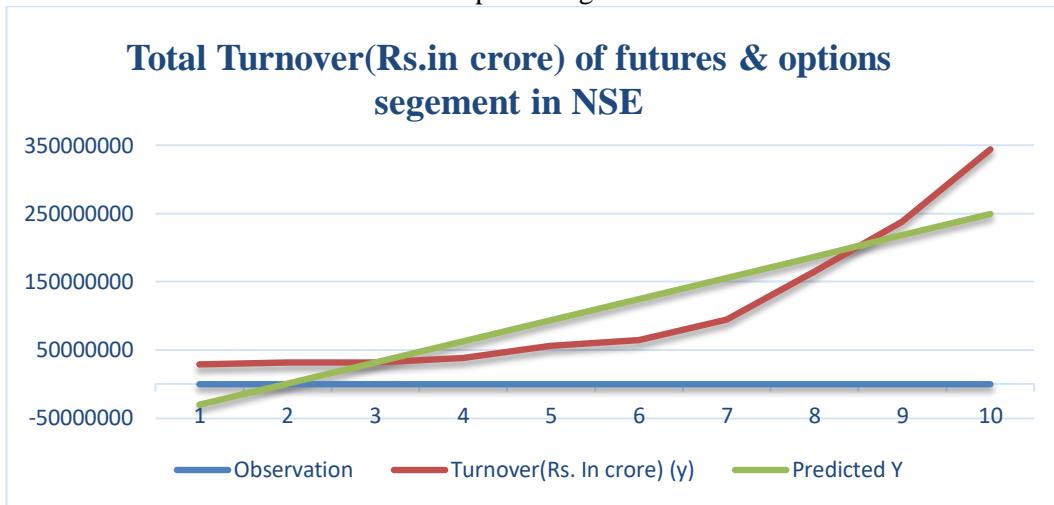
**FIGURE 3.**Futures and Options segments of Turnover in BSE



Source: Table-5

The figures above depict the actual and predicted total turnover in the futures and options segments of financial derivatives for the BSE Indian stock exchange during the study period. We discovered that the predicted total turnover value was significantly higher than the actual trend line during the period. The optimal point of trend in both the actual and predicted total F & O segment turnover values are the same, and in the years 2012 to 2013 and 2015 to 2016, the future trend line reached the interception point, while the movement of the actual trend line was insignificant in comparison to the predicted total turnover value, indicating that BSE has made a significant contribution to the growth of Indian financial derivative trading. Finally, the predicted total F & O segment turnover shows a linear trend line throughout the study period, indicating that BSE needs to improve investor and trader participation in F & O segments.

**FIGURE 4.**Futures and Options segments of Turnover in NSE



Source: Table-5

The above figure 4 depicts the actual and predicted total turnover in the futures and options segments of financial derivatives for the NSE Indian stock exchange during the study period. From 2010 to 2020, the total F & O segment of turnover values has a positive relationship with both predicted and actual values. The figure shows that the two interception points of the actual and predicted lines are the same in the observation years of 2013 and 2018, and the predicted value is greater than the actual value in 2014 and 217. Hence, the movement of the actual value line has moved significantly, indicating that the NSE has made a significant contribution to the growth of Indian financial derivative trading.

## 2. Comparisons analysis using a statistical tool.

The tables below show the Paired Samples test used to compare the BSE and NSE in terms of futures and options turnover values over the study period.

**TABLE 1.** Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	BSE-Index future Turnovers(Rs.in crore)	44665.7130	10	61169.77542	19343.58143
	NSE-Index future Turnovers(Rs.in crore)	4360639.7350	10	1189413.08892	376125.44398
Pair 2	BSE- Stock future Turnovers(Rs.in crore)	7980.7610	10	16862.52727	5332.39933
	NSE- Stock future Turnovers(Rs.in crore)	9261280.0290	10	4837400.69450	1529720.41495

Source: SPSS 16.0.

Table 1 includes pairs 1 and 2. Pair 1 compares the traded value of index-futures “turnover” values (“Rs”.in crore) on the BSE and NSE. The result shows that the NSE index futures turnover was more favourable than the BSE index-futures turnover’. Pair 2 in Table One showed the comparison between the traded values of stockfutures on the Indian stock exchanges (BSE and NSE) from 2010-2011 and 2019-2020. The “Paired Samples statistics” show that NSE

stock-future turnover performed better than BSE-“stock future turnover” during the studied periods.

**TABLE 2.** Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	BSE &NSE-Index turnover (Rs.in crore)	future	.10	-.639 .047
Pair 2	BSE &NSE-Stock turnover (Rs.in crore)	future	.10	-.430 .215

Source: SPSS 16.0

“Paired Samples Correlation”, as shown in the table above, refers to evaluating the relationship between the two pairs (1, 2). Pair-1 indicates a “negative correlation” ( $r = -0.639$ , sig 0.047) between two variables in the index-futures turnover on the BSE and NSE. Pair-2 shows that two variables in” stock-future” turnover on the BSE and NSE have decreasing relationships with a negative correlation ( $r = -0.430$ , sig 0.215). In both pairs, we found a negative “correlation” between NSE and BSE, which indicates that the two variables have a different association when it comes to the performance of the financial derivatives market inthe Indian stock exchange.

**TABLE 3.** Paired Samples Test

	Paired Differences						t	df	Sig. (2-tailed)			
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference								
				Lower	Upper							
Pair 1	BSE index future turnover (Rs.in crore) -NSE index future turnover (Rs.in crore)	4315974.02200	1229419.17720	388776.47990	-5195447.52074	343650.052326	-11.101	9	.000			
Pair 2	BSE Stock future turnover (Rs.in crore) - NSE Stock future turnover (Rs.in crore)	9253299.26800	4844670.45167	1532019.31402	-12718967.73275	578763.080325	-6.040	9	.000			

Source: SPSS 16.0

The “t-test” is employed to compare two pairs (1 and 2) in the table above. The purpose of the use of the "T-test" is to determine whether there is a “statistically significant” difference in the index and stock-futures turnover values between the BSE and NSE. We assume the effect size of the difference between the above table pairs. We imply that ("Cohen's"  $d = \frac{t^2}{t^2 + (N - 1)}$ "where “t” refers to the "t statistic" shown in the table labelled "paired samples test," and “N” refers to the number of the studied period),  $d_1 = 0.93$  (pair 1), indicating that there is a large

difference between the index future on the BSE and the index future on the NSE, and ( $d_2 = 0.80$  (pair 2)), indicates that there was a large difference size between the stock futures on the BSE and the NSE. The term "Null Hypothesis (H1)" has been formalized in pair-1, (No significant difference between the turnover values of index-futures on the BSE and the turnover values of index-futures on the NSE.) Therefore, the "t-test" value in the above table result shows that (-11.101, DF = 9, p = 0.001), indicating that the proposed "null hypothesis (H1)" was not accepted because there was a "significant difference" between the turnover value of the index-futures on the BSE and the turnover value of index futures on the NSE. The "Null Hypothesis (H2)" has been formalized in pre-2, which means "there was no "significant difference" in the" turnover values" of BSE and NSE "stock-futures," as a result of "DF" = 9 and P = 0.000,) and (t-test value of -6.040.). It concluded that the proposed "null hypothesis" was rejected because there was a "significant difference" between the "turnover value of stock futures" on the BSE and the "turnover value of stock futures" on the NSE.

**TABLE 4.** Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Mean	Error
Pair 1	BSE-Index Option turnover(Rs.in crore)	4146913.2856	10	6534362.64390	2066346.90123	
	NSE-Index Option turnover(Rs.in crore)	90222244.5100	10	97808096.58335	30929635.88091	
Pair 2	BSE-Stock Option turnover(Rs.in crore)	30845.6027	10	56667.06937	17919.70075	
	NSE-Stock Option turnover(Rs.in crore)	5382176.7430	10	4533101.88864	1433492.68337	

Source: SPSS 16.0

"Paired sample statistics" imply the difference between the BSE and the NSE by comparing the mean result and standard deviation in the index and stock options. The results show that the index options for the BSE ( $M = 0.41$  crore,  $SD = 0.65$  crores) and NSE ( $M = 9.02$ ,  $SD = 9.78$ ) were "significantly different", with a 95% confidence interval of 8.60 crore between the two parameters. Similarly, pair 2 shows that the NSE option stock has a higher turnover value than the BSE option stock.

**TABLE 5.** Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	BSE& NSE Index option turnover (Rs.in crore)	10	-.386	.271
Pair 2	BSE& NSE Stock option turnover (Rs.in crore)	10	-.293	.411

Source: SPSS 16.0

The table above shows that "Paired Samples Correlation" refers to measuring the relationship between the two pairs (1, 2). In the index options turnover, the BSE and the NSE have a negative correlation ( $r = -0.386$ , sig 0.271). Similarly, Pair-2 reveals that two variables in stock-options turnover on the BSE and NSE have decreasing negative correlations ( $r = -0.293$ , sig 0.215). In both pairs, we discovered a negative correlation between NSE and BSE, indicating that

the two variables have a different contribution in terms of the performance of the Indian stock exchange's financial derivatives market.

**TABLE 6.** Paired Samples Test

	Paired Differences						t	df	Sig. (2-tailed)			
	“Mean”	“Std. Deviation”	“Std. Error Mean”	“95% Confidence Interval of the Difference”								
				Lower	Upper							
BSE-Index Foption turnover(Rs.in crore) – NSE- Index option turnover(Rs.in crore)	-86075331.7	100511339.74774	31784476.42779	-157976812.24134	-14173.850.20752	-2.708	9	.024				
BSE-Stock Foption turnover(Rs.in crore) – NSE- Stock option turnover(Rs.in crore)	-5351331.1723	4550049.416248	1438851.9346	-8606240.41346	-20964.21.86722	-3.719	9	.005				

Source: SPSS 16.0

We used "Cohen's" d to calculate the differences in sizes between variables ("Cohen's" d = " $t^2$ " /  $t^2$  + (N - 1) where "t" refers to the "t-statistics" shown in the table labelled "paired samples test," and "N" refers to the number of studied periods). We found that d1 = 0.45 (pair 1), indicating a medium difference between BSE and NSE index options turnover value, and d2 = 0.61 (pair 2), indicating a slightly larger difference between BSE and NSE stock-options turnover. The hypothesis test focused on index options and stock option turnover on the BSE and NSE. "Null Hypothesis H3" claimed that "there is no significant difference between the turnover values of "index-options" on the BSE and the turnover values of the "index-options" on the NSE." The t-value result differed from that at "t(9)" = -2.708, (P = .024); this was due to "sig (2-tailed)" or p 0.05, and the "95% CI". Hence, the null hypothesis was rejected because the BSE and NSE index option values differed. When the null hypothesis (H4) is true, the following tests determine whether there is no "statistically significant difference" between the turnover values of stock options on the BSE and the turnover values of stock options on the NSE. As a result, the expected null hypothesis was rejected because the t-value result showed that at "t (9)" = -3.719, (P = .005) less than 'sig (2-tailed)' or p 0.05, with the '95% CL' including zero or a zero-mean difference, which was well within the range of likely pair fluctuations, which means that the turnover values of stock options on the BSE and the turnover values of stock options on the NSE have "significantly differed".

## Conclusion

Financial derivatives are the innovative financial market instruments of the twenty-first century. Financial instruments allow market participants to manage various types of risks, such as market risk, price risk, interest rate risk, credit risk, and counterparty default, to increase their

margins in financial trading. Since 2001, the Indian stock exchange market has provided a digitalized platform for investors by establishing a distinct market segment that includes a derivative market segment and a security market segment. The evidence shows that the F & O segments are widely used by derivatives market participants, including hedgers, speculators, and arbitrators on the NSE and BSE, resulting in a positive trend in Indian derivatives trading in terms of contract number and turnover. However, there are still issues with some participants who lack professional knowledge and insufficient digitalized facilities at stock exchanges and clearinghouses. Although the Indian stock exchanges could be affected by external economic and political factors, their performance has declined due to the conflict between India and China in 2018-2019. In this study, it employed the paired sample test to compare futures and options turnover values on the BSE and NSE, and the result showed the paired sample test rejected the null hypothesis because the p-value was greater than the significant level (2-tailed) or  $p > 0.05$  with the 95% confidence level. In other words, the pairs have a size difference between the NSE and BSE in terms of turnover, while the index options have significant growth year after year on those stock exchanges. Subsequently, index futures have shown moderate growth, while stock futures and options have declined. Hence, the NSE market provides a platform that operates on a high-quality, digitalized platform that increases Indian derivatives trading today. With the help of the regulatory framework of SEBI, the Indian stock exchanges (NSE & BSE) should increase investor and trader participation in all F & O segments and develop adequate professional knowledge. Furthermore, the competent authorities should also take the necessary steps to increase the volume of futures and options traded on the NSE and BSE.

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